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Application of Transmission Kikuchi Diffraction in SEM and Some Sample Preparation Challenges

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Electron Backscatter Diffraction (EBSD) is a well-stablished technique for automatically obtaining microstructure related crystallographic information in a scanning electron microscope (SEM). Although EBSD has been applied to characterize ultra-fine grained metals, the spatial resolution of the technique has always been a limiting factor for investigation of materials with crystallographic features in the nano-meter range. Recently, Geiss and Keller [1] proposed the use of thin electron transparent specimen placed perpendicular to the standard EBSD sample position to obtain crystallographic information with higher spatial resolution than conventional EBSD in the SEM. This new technique has been termed “transmission electron forescatter diffraction (t-EFSD)” or “transmission Kikuchi diffraction in the SEM (SEM-TKD)” and is emerging as a very promising technique to characterize materials in the nano-scale.

In this presentation the application of TKD on material systems that are not conventionally investigated by EBSD, such as nanowires and nano-plasmonic discs will be shown. Additionally, application of SEM-TKD to characterize fine microstructure features in metallic materials prepared both by electropolishing as well as by focused ion beam (FIB) will be presented, the importance of sample thickness will be discussed and some challenges in sample preparation will be outlined. Finally, some very recent result of in-situ heat treatment experiments will be presented.

[1] Geiss, R., Keller, R., Sitzman, S., & Rice, P. (2011). New Method of Transmission Electron Diffraction to Characterize Nanomaterials in the SEM. *Microscopy and Microanalysis, 17*(Supplement S2), 386–387.